Reductions in Fine Particulate Matter and Improvements in Life Expectancy

May 28, 2009

Air Resources Board

California Environmental Protection Agency

Background

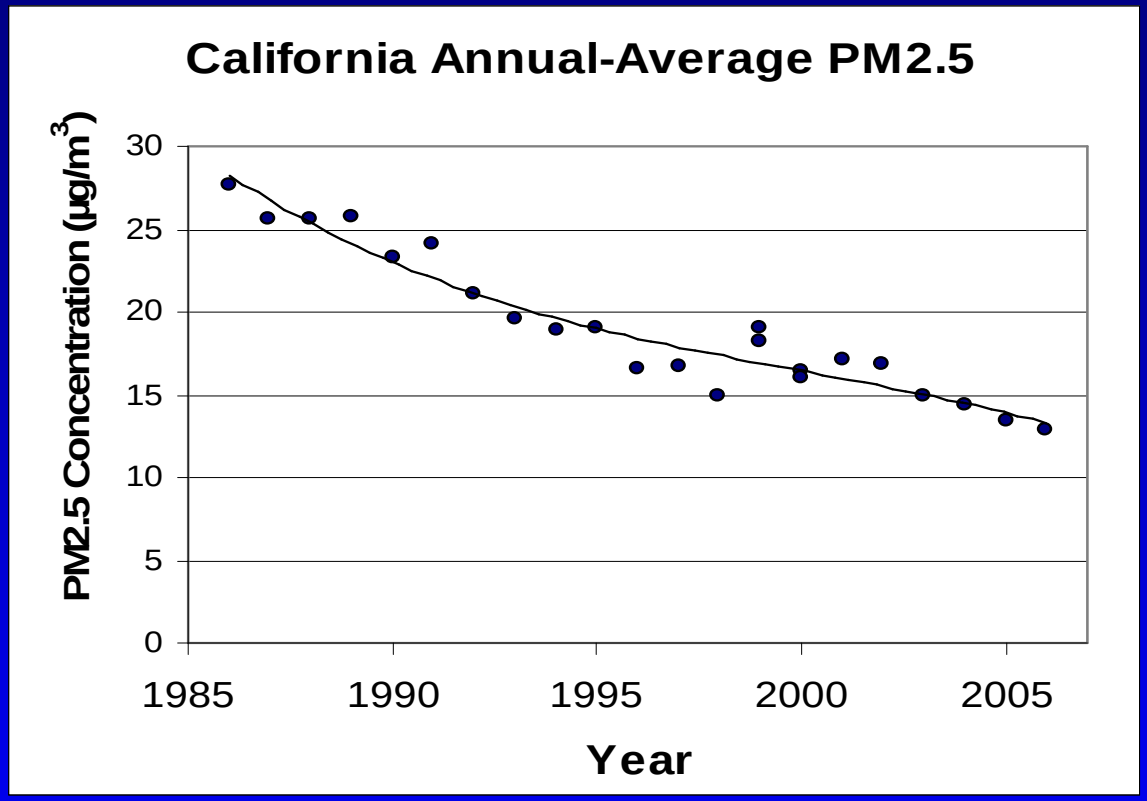
- Long-term and short-term exposure to PM2.5 associated with premature death and illness
  - 18,000 (5,600-23,000) deaths per year in California associated with exposure to PM2.5
- As PM2.5 declined, has life expectancy increased?*

***Pope, CA et al. (2009). Fine Particulate Air Pollution and Life Expectancy in the United States. N Engl J Med 2009; 360:376-386. Supported by the Center for Disease Control and Prevention, U.S. EPA, NIEHS, and the Mary Lou Fulton Professorship, Brigham Young University.**

Study Design

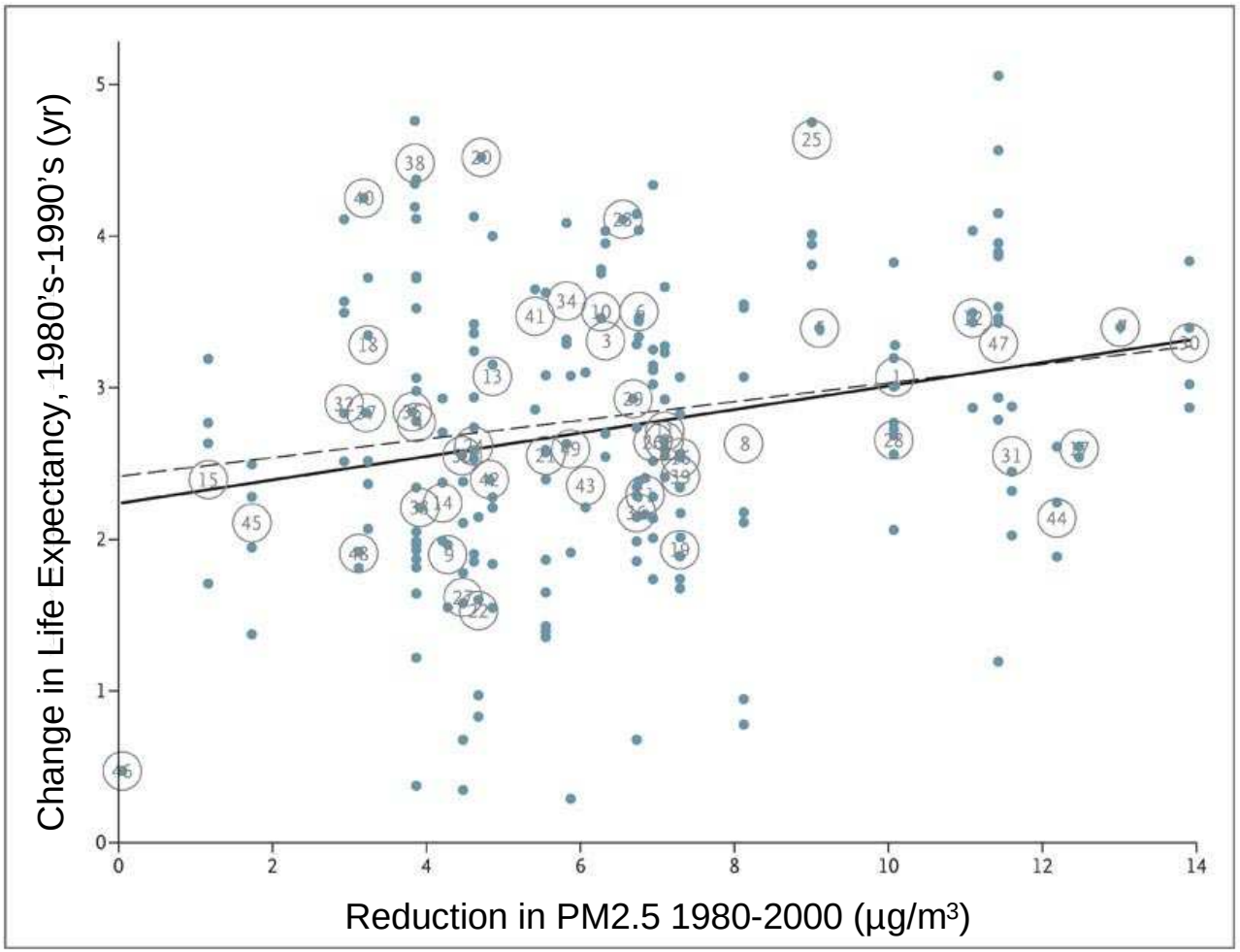
- Life Expectancy and PM2.5 Levels
  - 51 U.S. metropolitan areas, including Los Angeles, San Diego, San Francisco, and San Jose
- Study time period
  - Compare 1978-82 to 1999-2000
- Controlled for:
  - Socioeconomic status: income, % high school graduates
  - Demographic characteristics: race/ethnicity, urban residence
  - Smoking: deaths from lung cancer, COPD

PM2.5 Reduction



- Nationwide PM2.5 decreased 6.5 µg/m^3 (1980-2000)
- California PM2.5 decreased 13 µg/m^3 (1987-2006)

Changes in Life Expectancy and PM2.5 1980-2000



Pope C et al. N Engl J Med 2009;360:376-386

Study Results

- From 1980 to 2000 life expectancy improved 2.7 years in the United States
  - Due to improved health care, lifestyle, and diet
- For every decrease of 10 µg/m^3 PM2.5
  - Life expectancy improved 0.61 (± 0.20) years
- Reductions in PM2.5 accounted for 15% of life expectancy improvement

Gains in Life Expectancy with Preventive Interventions

Disease and Intervention	Gain in Life Expectancy (in months)	
Cardiovascular disease	**Men**	**Women**
Statin for low LDL/ high CRP	10.2	7.9
Achievement 20% cessation rate in smokers	5.5	6.7
Reduction of diastolic BP to 88 if 90 -94	13.2	10.8
Reduction of total cholesterol		
to 200mg/dl If 200 to 239 mg/dl	6.0	4.8
to 200mg/dl if 240 to 299 mg/dl	20.4	18.0
Cancer prevention		
10 years of biannual mammography for 50 year old women		0.8
Pap smear every 3 years for 55 years for 20 year old women		3.1
Colonoscopy every 5 years for 25 years in 50 year olds	2.5	2.2

Data for slide courtesy of Dr. Telles

Conclusions

- Reductions in PM2.5 over last 20 years
  - Result in measureable improvements in life expectancy
  - Validate ARB's efforts to reduce PM2.5 exposure